

CONSERVATION PRACTICE STANDARD

STREAMBANK AND SHORELINE PROTECTION

(Feet)

CODE 580

Definition

Treatment(s) used to stabilize and protect banks of streams or constructed channels, and shorelines of lakes, reservoirs, or estuaries.

complexity, not normally within the scope of NRCS authority or expertise.

Criteria

General Criteria Applicable to All Purposes

Measures must be installed according to a site-specific design and in accordance with all applicable local, state, and federal laws and regulations.

An assessment of unstable streambank or shoreline sites shall be conducted in sufficient detail to identify the causes contributing to the instability (e.g. livestock access, watershed alterations resulting in significant modifications of discharge or sediment production, in channel modifications such as gravel mining, head cutting, water level fluctuations, boat-generated waves, etc.). Due to the complexity of such an assessment an interdisciplinary team should be utilized.

Purposes

- To prevent the loss of land or damage to land uses, or other facilities adjacent to the banks, including the protection of known historical, archeological, and traditional cultural properties.
- To maintain the flow or storage capacity of the water body.
- To reduce the offsite or downstream effects of sediment resulting from bank erosion.
- To improve or enhance the stream corridor for fish and wildlife habitat, aesthetics, recreation.

Protective measures to be applied shall be compatible with improvements planned or being carried out by others.

Protective measures shall be compatible with the bank or shoreline materials, water chemistry, channel or lake hydraulics, and slope characteristics both above and below the water line.

Conditions Where Practice Applies

This practice applies to streambanks of natural or constructed channels and shorelines of lakes, reservoirs, or estuaries that are experiencing erosion. It applies to controlling erosion where the problem can be solved with structural measures, vegetation, or upland erosion control practices. It does not apply to erosion problems on main oceanfronts and similar areas of

End sections shall be adequately bonded to existing measures, terminate in stable areas, or be otherwise stabilized to prevent flanking of the treatment.

Where a structural measure is applied, it shall as a minimum, be placed to a height equal to the annual flood or the top of bank, whichever is lower.

Protective measures shall be installed on stable slopes. Bank or shoreline materials and type of measure installed shall determine maximum slopes.

Designs will provide for protection of installed treatments from overbank flows resulting from upslope runoff and flood return flows.

Internal drainage for bank seepage shall be provided when needed. Geotextiles or properly designed filter bedding shall be used on structural measures where there is the potential for migration of material from behind the measure.

Measures applied shall not adversely affect threatened and endangered species or species of special concern as defined by the appropriate state and federal agencies.

Measures applied shall not adversely affect significant cultural resources.

Measures shall be designed for anticipated ice action, wave action, and fluctuating water levels.

All disturbed areas around protective measures shall be protected from erosion. Coordinate the installation of vegetative and structural components as

construction progresses to insure stabilization. Vegetation shall be selected that is best suited for the soil/moisture regime.

Additional Criteria for Streambanks

A site assessment shall be performed to determine if the causes of instability are local (e.g. poor soils, high water table in banks, alignment, obstructions deflecting flows into bank, etc.) or systemic in nature (e.g. aggradation due to increased sediment from the watershed, increased runoff due to urban development in the watershed, degradation due to channel modifications, etc.). The assessment need only be of the extent and detail necessary to provide a basis for design of the bank treatments and reasonable confidence that the treatments will perform adequately for the design life of the measure.

If the failure mechanism is a result of the degradation or removal of riparian vegetation, stream corridor restoration shall be implemented, where feasible, (see Additional Criteria for Stream Corridor Improvement) as well as treating the banks.

Stream segments to be protected shall be classified according to an appropriate system. Segments that are incised or contain the 5-year return period (20 percent probability) or greater flows shall be evaluated for further degradation or aggradation.

Measures shall be functional for the design flow and sustainable for higher flow conditions based on acceptable risk.

Hazard Class: A hazard classification shall be assigned each site to establish the level of design for streambank protection measure. Hazard classes are:

- A. **Low Hazard** - sites where failure of measure would result in damage to cropland, woodland, pastureland, or other unimproved lands.
- B. **Medium Hazard** - sites where failure of measure would result in damage to uninhabited structures, farm building, limited access roads and their appurtenances, parks, and other improved properties.
- C. **High Hazard** - sites where failure of measure would result in damage to residences, businesses, state and local highways and their appurtenances, or other structures, which if imperiled would threaten the life and safety of people.

Hydraulic Design Criteria

Hazard Class	Min. Design Storm (MDS)	Primary Design Storm Protective Measure
A	Bankfull* or 10 yr - 24 hr whichever is lower	Vegetative and/or Structural
B	25 yr - 24 hr	Structural and Vegetative
C	100 yr - 24 hr	Structural**

*Bankfull -- at "channel-forming flow"; generally a 1- to 2-year event.

**Vegetative may be used above MDS.

Installation of streambank protection measures shall not create additional hazards to any upstream, downstream, or opposite bank. Treatments shall not induce an increase in natural erosion.

The channel grade shall be stable based on a field assessment before any permanent type of bank protection can be considered feasible, unless the protection can be constructed to a depth below the anticipated lowest depth of streambed scour. Stream channel stabilization (CP 584) shall be utilized where necessary to stabilize the channel grade.

A protection toe shall be provided based on an evaluation of stream bed and bank stability. Toe erosion shall be stabilized by treatments that redirect the stream flow away from the toe and/or by structural treatments that armor the toe.

Channel clearing to remove stumps, fallen trees, debris, and bars shall only be done when they are causing or could cause detrimental bank erosion or structural failure. Habitat forming elements that provide cover, food, and pools, and water turbulence shall be retained or replaced to the extent possible.

Changes in channel alignment shall not be made unless the changes are based on an evaluation that includes an assessment of both upstream and downstream fluvial geomorphology. The current and future discharge-sediment regime shall be based on an assessment of the watershed above the proposed channel alignment.

The alignment of low-flow channels should not be changed more than necessary to accomplish a stable bank slope, and to

establish and maintain vegetation. Should significant realignment be proposed, those portions of the channel shall be designed in accordance with the Open Channel (582) Standard.

Measures shall be designed to avoid an increase in natural erosion downstream.

Measures planned shall not reduce stream flow access to the floodplain.

When water surface elevations are a concern, the effects of protective measures shall not increase flow levels above those that existed prior to installation.

When banksloping is used, the banks must be stable against sliding after construction and flat enough to maintain vegetation. In no case shall banks be sloped steeper than 2H:1V.

Additional Criteria for Stream Corridor Improvement

Stream corridor vegetative components shall be established as necessary for ecosystem functioning and stability. The appropriate composition of vegetative components is a key element in preventing excess long-term channel migration in re-established stream corridors. The establishment of vegetation on channel banks and associated areas shall also be in accordance with conservation practice standard Channel Bank Vegetation, PA322.

Measures shall be designed to achieve habitat and population objectives for fish and wildlife species or communities of

concern as determined by a site-specific assessment or management plan. Objectives are based on the survival and reproductive needs of populations and communities, which include habitat diversity, habitat linkages, daily and seasonal habitat ranges, limiting factors and native plant communities. The type, amount, and distribution of vegetation shall be based on the stabilization requirements of the site and accommodate the fish and wildlife species or communities of concern to the extent possible.

Measures shall be designed to meet aesthetic objectives as determined by a site-specific assessment or management plan. Aesthetic objectives are based on human needs, including visual quality, noise control, and microclimate control. Construction materials, access, grading practices, and other site development elements shall be selected and designed to be compatible with adjacent land uses.

Measures shall be designed to achieve recreation objectives as determined by a site-specific assessment or management plan. Recreation objectives are based on type of human use and safety requirements.

Additional Criteria for Shorelines

All revetments, bulkheads, or groins are to be no higher than 3 feet (1 meter) above mean high tide, or mean high water in non-tidal areas.

Structural shoreline protective measures shall be keyed to a depth to prevent scour during low water.

For the design of structural measures, the site characteristics below the waterline shall be evaluated for a minimum of 50 ft. (15 meters) horizontal distance from the shoreline measured at the design water surface.

The height of the protection shall be based on the design water surface plus the computed wave height and freeboard. The design water surface in tidal areas shall be mean high tide.

When vegetation is selected as the protective treatment, a temporary breakwater shall be used during establishment when wave run up would damage the vegetation.

CONSIDERATIONS

When designing protective measures, consider the changes that may occur in the watershed hydrology and sedimentation over the design life of the measure.

Consider utilizing debris (e.g. rootwads, rocks) removed from the channel or streambank into the treatment design when it is compatible with the intended purposes.

Use construction materials, grading practices, vegetation, and other site development elements that minimize visual impacts and maintain or complement existing landscape uses such as pedestrian paths, climate controls, buffers, etc. Avoid excessive disturbance and compaction of the site during installation.

Utilize plant cultivars and species that are proven effective for the measures applied and are compatible with local ecosystems. Avoid introduced or exotic species that could become nuisances. Consider species that have multiple values such as those suited for biomass, nuts, fruit, browse, nesting, aesthetics and tolerance to locally used herbicides. Avoid species that may be alternate hosts to disease or undesirable pests. Species diversity should be considered to avoid loss of function due to species-specific pests.

Livestock exclusion should be considered during establishment of vegetative measures, and appropriate grazing practices applied after establishment to maintain plant community integrity. Wildlife may need to be controlled during establishment of vegetative measures. Temporary and local population control methods should be used with caution and within state and local regulations.

Measures that promote beneficial sediment deposition and the filtering of sediment, sediment-attached, and dissolved substances should be considered.

Consider maintaining or improving the habitat value for fish and wildlife, including lowering or moderating water temperature, and improving water quality.

Consideration should be given to protecting side channel inlets and outlets from erosion.

Toe rock should be large enough and of a proper size gradation to provide a stable base and enhance aquatic habitat.

Consider maximizing adjacent wetland functions and values with the project design and minimize adverse effects to existing wetland functions and values.

When appropriate, establish a buffer strip and/or diversion at the top of the bank or shoreline protection zone to help maintain and protect installed measures, improve their function, filter out sediments, nutrients, and pollutants from runoff, and provide additional wildlife habitat.

Consider conservation and stabilization of archeological, historic, structural and traditional cultural properties when applicable.

Measures should be designed to minimize safety hazards to boaters, swimmers, or people using the shoreline or streambank.

Protective measures should be self-sustaining or require minimum maintenance.

PLANS and SPECIFICATIONS

Plans and specifications for streambank and shoreline protection shall be prepared for specific field sites and based on this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

Plans shall include treatments to minimize erosion and sediment production during construction and provisions necessary to comply with conditions of any environmental agreements, biological opinions or other terms of applicable permits.

OPERATION AND MAINTENANCE

A plan shall be developed which provides specific guidance to the owner/operator on the proper operation and maintenance of the system. It shall also provide for periodic inspections and prompt repair or replacement of damaged components or erosion.

In order to ensure plant community establishment and integrity, a vegetative management plan shall be prepared in accordance with conservation practice standard, Channel Bank Vegetation, PA322.

REFERENCES

1. EFH, Chapters 2 & 16
2. Technical Releases 20, 25 & 55
3. Chesapeake Bay Riparian Handbook
4. Stream Corridor Restoration Handbook
5. Forest Buffer Toolkit (PADEP)
6. Conservation Practice Standard, Channel Bank Vegetation, PA322